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GB 1481645 A	GB 0350277 A
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(54) Abstract Title
Base assembly for mounting a rail on a support structure

(57) The base assembly 1, utilising resilent clips, comprises a base plate 2 and two spaced rail clip receiving members 3, each being detachably mounted on the base plate 2 such that the base plate can be slid between the underside of an existing rail and the support structure when at least one rail clip receiving member 3 is detached therefrom without lifting the rail or requiring any excavation of material from beneath the rail. Each clip receiving member 3 has dovetail projections mating with corresponding grooves in the plate 2 laterally of the rail 9. The members 3 are bolted to the plate 2 at least one member aperture for the bolt being elongate for lateral member, and thus rail, adjustment.

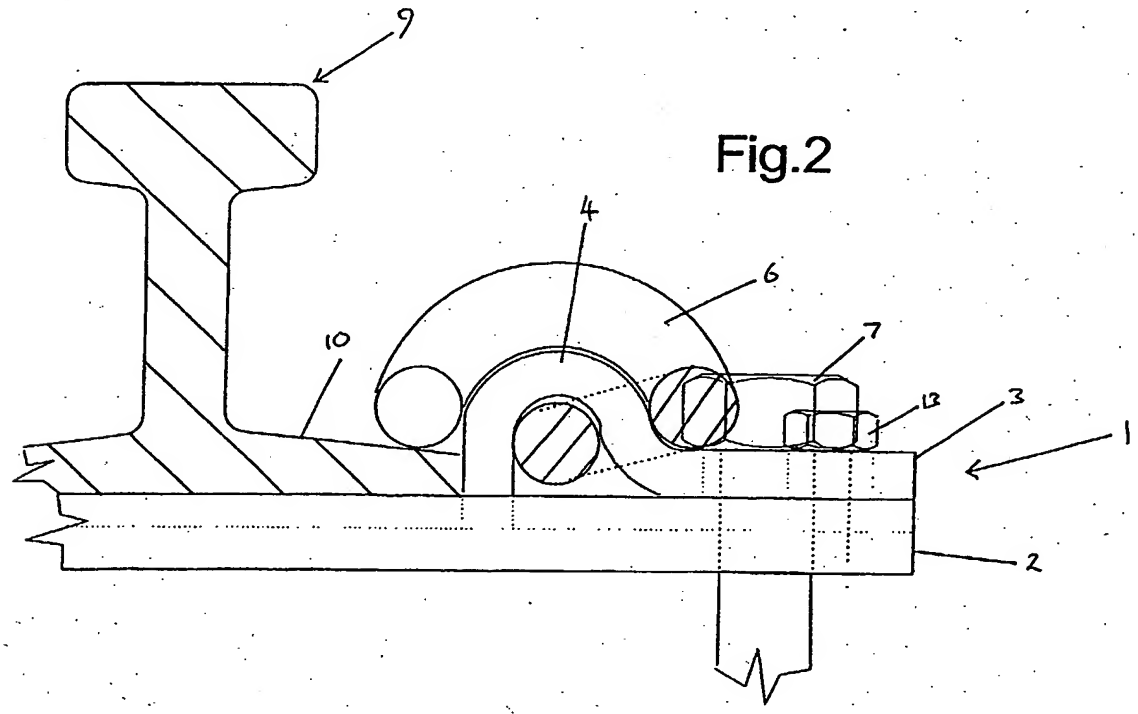

Fig.2

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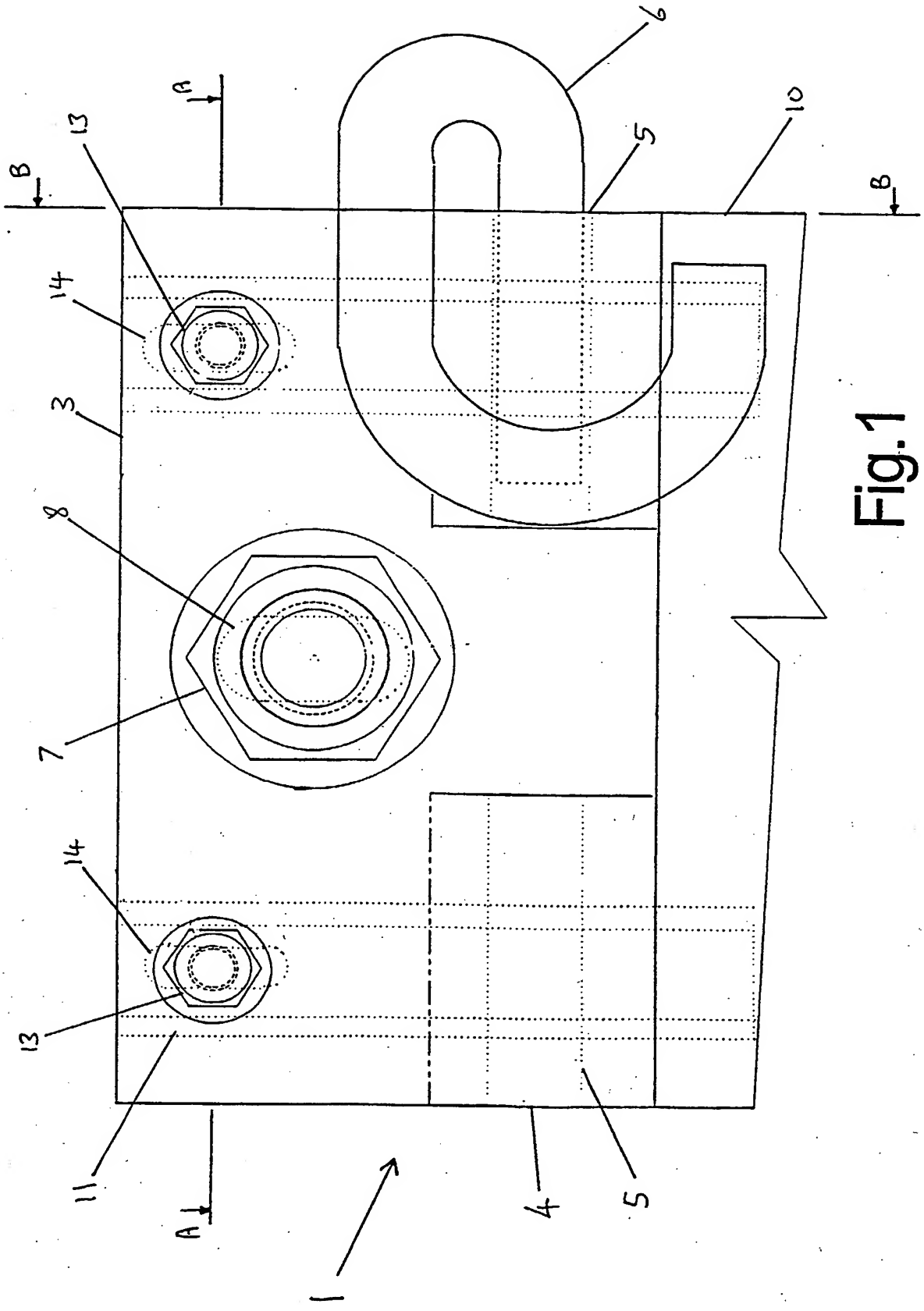
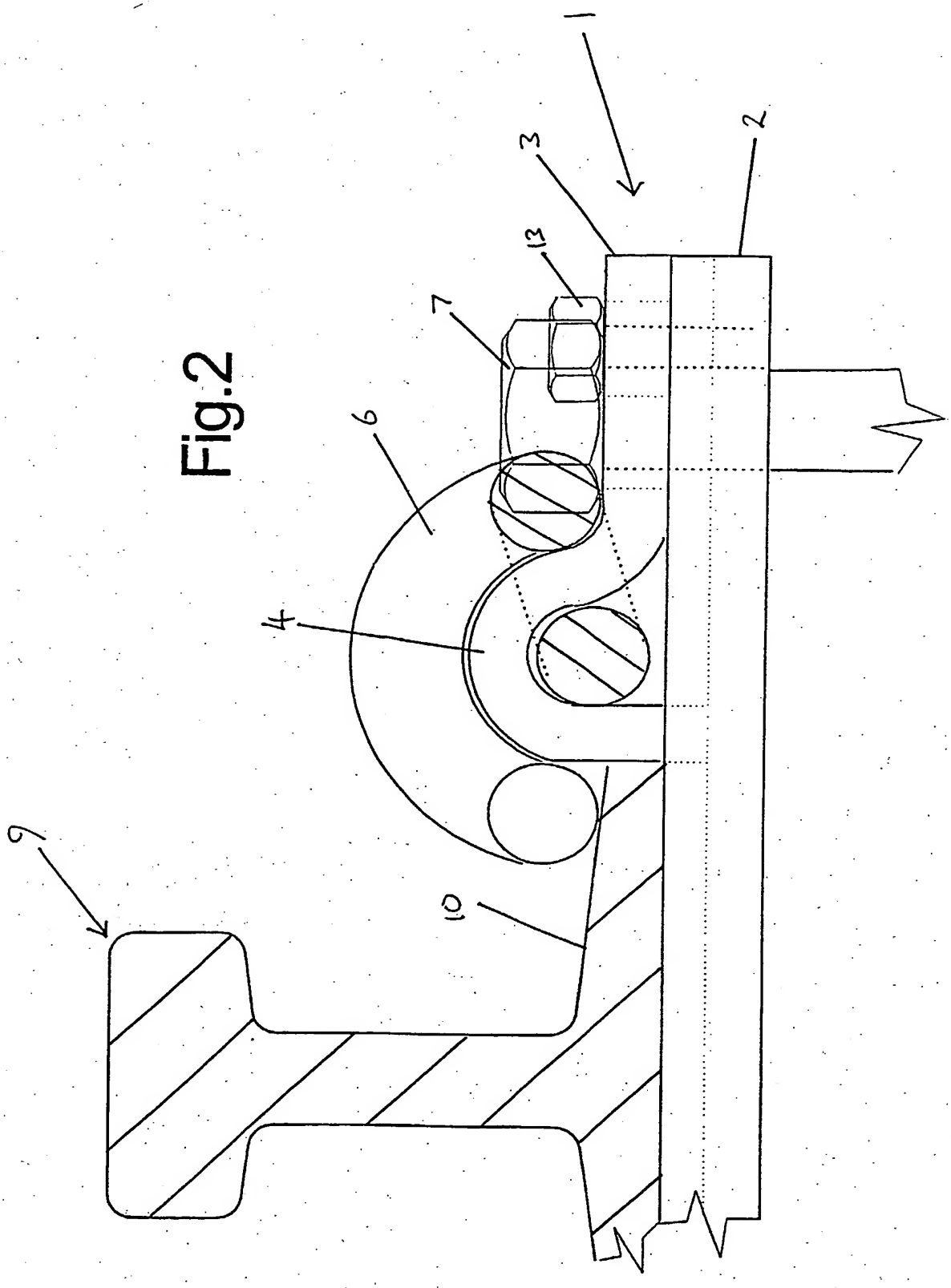


Fig.1

Fig.2



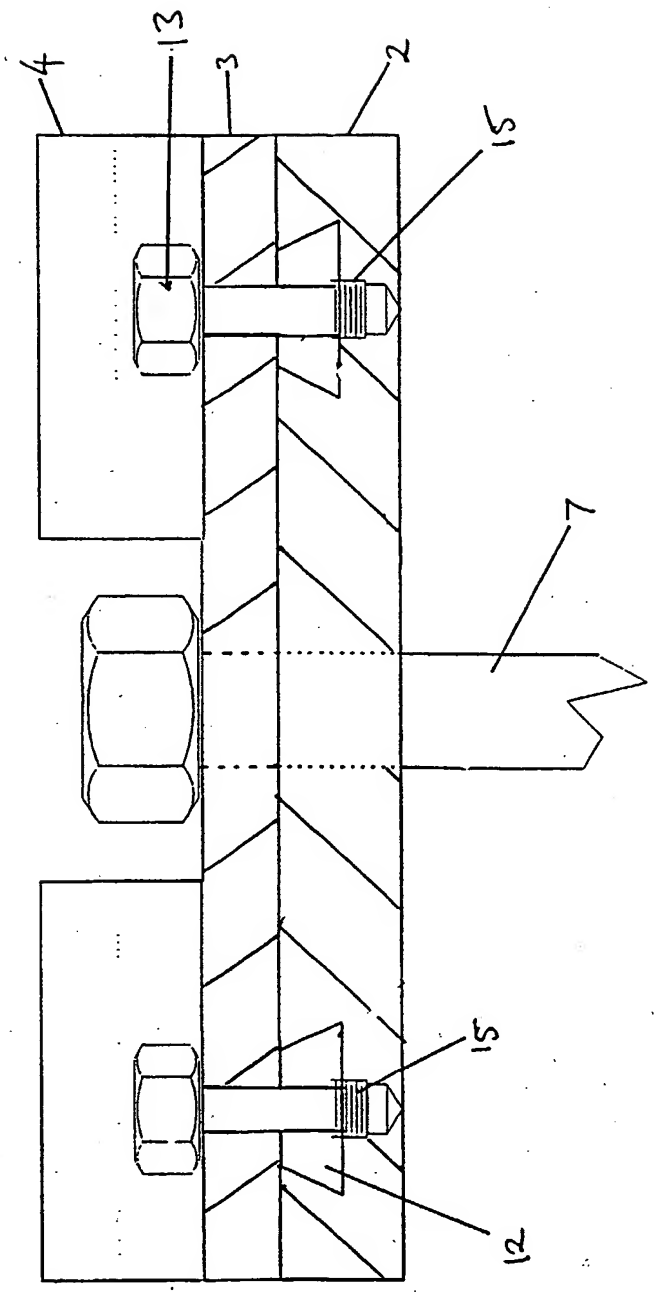


Fig. 3

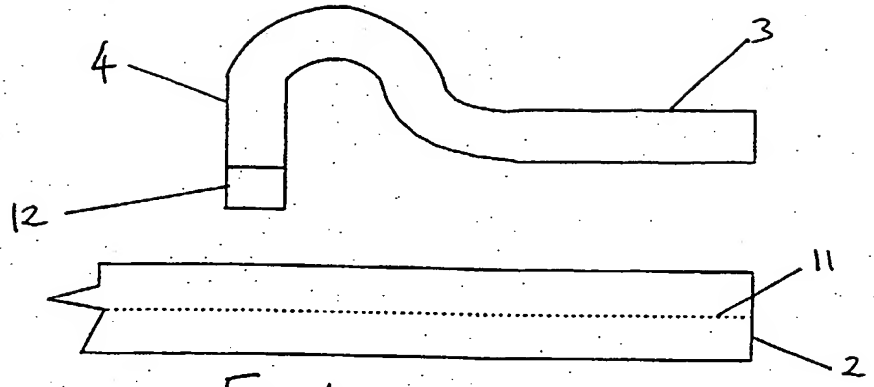


Fig. 4

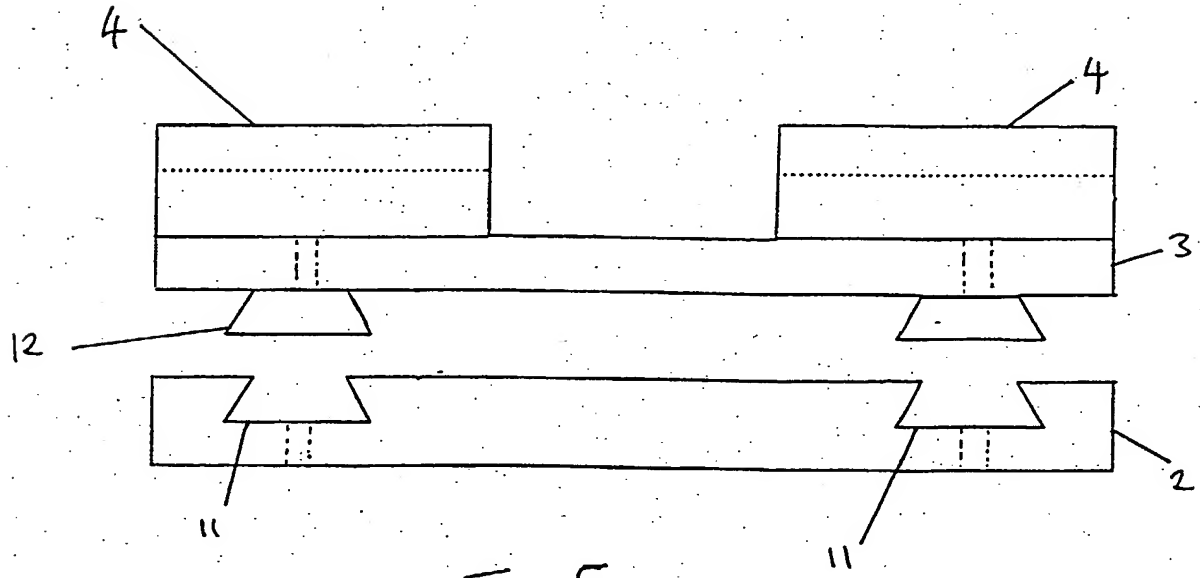


Fig. 5

BASE ASSEMBLY FOR MOUNTING A RAIL ON A SUPPORT STRUCTURE

The present invention concerns an improved base assembly for removably mounting a rail on a support structure by means of resilient rail clips retained on the base assembly.

Throughout the rail network, particularly in the inner cities, underground rail systems have been developed as a means of rapid transport beneath the congested streets. These systems are generally not laid as conventional systems, i.e. rails mounted on wooden sleepers, but instead the rails are fixed directly to a concrete support structure by means of resilient metal rail clips such as Pandrol (RTM) clips, a portion of the clips being retained in an aperture in a raised shoulder portion of a steel base member secured to the concrete support structure. Frequently, the base member is in the form of a steel base plate, incorporating raised clip retaining shoulders, the base plate being secured to the concrete support structure by means of bolts. Alternatively, the base member is sometimes cast directly into the concrete support structure.

In some systems, known as "slab track", a concrete sleeper arrangement has been utilised, to which the base plate is secured. However, the sleeper is cast into the concrete support structure, and not in the traditional ballast material.

In the prior art systems described above, the only maintenance arrangements envisaged at the time of their design was the replacement of the rails and/or clips. However, some of these systems are becoming quite dated now and a different type of problem is beginning to arise.

In some instances of the prior art base systems, the area of the concrete support with the footprint of the base member or base plate has deteriorated. This allows excessive movement of the rails, resulting in accelerated wear of the rolling stock, as well as the rail infrastructure in general. Likewise in the "slab track" system, the area around where the sleeper meets the concrete support structure is in some cases beginning to deteriorate. Furthermore, problems have arisen in relation to wear of the clip retaining apertures in the shoulder portions of the base plates. Because the prior art base assemblies are fixed in place, replacement of the defective parts becomes very difficult.

The adopted repair procedure at present is conducted by inserting a replacement base plate adjacent to the defective component.

The prior art replacement base plates are of a one-piece cast steel design, with the raised clip retaining shoulder portions as an integral part of the casting. Because the raised shoulder portions are in the form of upright posts on the base plate, this gives the component a fixed height dimension. In the existing railway construction, there is a limited fixed gap between the underside of the rail and the concrete support structure. The overall height of the base plate including the raised shoulder portions is greater than said fixed gap, preventing the base plate from being simply slid under the rail. As a result of this limitation, two different methods of base plate insertion are currently used.

The first method of repair involves removing the existing rail clips over a given distance, after which the existing rail section has to be lifted by means of jacks to obtain the required clearance between the underside of the rail and the support structure. Once this is achieved then the new base plates are slid under the rail into position adjacent the defective base plates. The rail is then lowered and the rail clips are re-fitted. Usually a gap remains between the underside of the new base plates and the underside of the base plate and the

concrete support structure which is then filled by injection grouting with a resilient compound.

The problems associated with this method are firstly the intensity of the labour required to lift the rails, and also the fact that if the problem area is on a curved section of track (as is generally the case due to the extra loading placed on the rails by trains travelling on curved sections) the rail is liable to spring into a straight position, making it very difficult to realign to the correct gauge. Another problem with this method is in most cases the rails are now of a continuous design, and are welded together at the joints. These welded joints can crack when subjected to lifting forces, resulting in the need for specialist equipment in order to affect an in-situ repair.

The second method of repair was developed to overcome the need to lift the rails as mentioned above. It involves excavating the concrete support structure beneath the rail, digging a deep enough pocket to allow the new base plate to be positioned under the rail. This method leaves an over deep pocket under the rail which needs to be re-instated with a rapid repair compound to an acceptable level to the underside of the base plate, in order to receive the second injection of resilient compound. Again, the disadvantage of this system is one of labour intensity, along with the number of operations required. This is then further complicated by the time required for curing of the initial infill material. Another disadvantage is that it is evident that a weakness has been introduced into the concrete support structure beneath the new base plate. This is the are where the base plate holding down bolts are secured, and therefore is not a desirable situation.

What both the above methods have in common is the time scale required to effect the installation of the finished component. Given that this work must take place in "engineering hours" (i.e. when the trains are not running) then the work needs to be undertaken in a typical window of three hours per day.

According to the invention there is provided a base assembly for mounting a rail on a support structure by means of resilient rail clips, said base assembly comprising a base plate and at least two spaced rail clip receiving members, characterised in that at least one of the rail clip receiving members is detachably mounted on the base plate such that the base plate can be slid between the underside of an existing rail and the support structure when the at least one rail clip receiving member is detached therefrom. By providing at least one detachable clip receiving member the need to lift the rail or excavate the support structure is avoided, since, when the detachable clip receiving member is removed, the height of the remaining base plate is no larger than the gap between the underside of the rail and the support surface, allowing the base plate to be easily slid under the existing rail, through the gap between the underside of the rail and the support structure. Once the base plate is in position the detachable clip receiving member can be reattached to the base plate and the rail clips can be fitted.

Preferably the at least one detachable clip receiving member is detachably retained on the base plate by means of at least one elongate groove, provided respectively in the upper surface of the base plate or in a lower portion of the detachable clip receiving members, cooperating with at least one corresponding projection, provided on the other of a lower portion of the detachable clip receiving portion or the upper surface of the base plate. Preferably the width of the elongate groove increases from the surface to the bottom of the groove in the manner of a dovetail joint, the projection being shaped correspondingly, to resist a force acting to separate the clip receiving member from the base plate. Preferably the at least one detachable clip receiving member is secured to the base plate by means of a bolt passing through a corresponding aperture in the detachable clip receiving member and being received in a threaded bore of the base plate. Advantageously the elongate slot extends from one side of the base plate in a direction transverse to normal axis of the rail and the bolt aperture is slotted to permit lateral

adjustment of the position of the clip retaining portion to be made with respect to the base plate.

Preferably the height of the base plate at least in the region thereof to be located under the rail and to the end or side in the region of the at least one detachably mounted clip receiving member is located is less than the gap between the underside of the rail and the support structure. Advantageously the upper surface of the base plate is substantially flat or planar.

According to another aspect of the invention there is provided a base assembly for mounting a rail on a support structure by means of resilient rail clips, said base assembly comprising a base plate, at least two spaced rail clip retaining members being detachably mounted on the base plate and wherein the base plate has at least a substantially flat or planar upper surface in which mounting apertures for the clip retaining members and for a plate securing bolt are provided.

According to a further aspect of the invention there is provided a method of repairing a rail system using a base assembly according to the first aspect of the invention, the method comprising the steps of, without lifting the rail, passing a major portion of the base plate through the gap between the lower surface of the existing rail and the support structure with the at least one detachable rail clip member unconnected to the base plate, positioning the base plate adjacent a defective base assembly, attaching and securing the detachable rail clip receiving member onto the base plate, fitting rail clips to the rail clip receiving members of the base assembly to secure the rail to the new base assembly and securing the base assembly to the support structure.

Preferably the method includes the further step of filling any resultant gap between the underside of the base plate and the support structure by injection grouting with a resilient compound.

The present invention will now be described further, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a plan view of one side of a base assembly with a rail section and rail clips fitted, the opposite side (not shown) being a mirror image of the side shown;
Fig. 2 is a sectional view taken on line B-B of Fig. 1;
Fig. 3 is a sectional view taken on line A-A of Fig. 1;
Fig. 4 is a side view of the base assembly with the rail clip receiving member detached;
Fig. 5 is an end view of the base assembly with the rail clip receiving member detached.

In Figs. 1 and 2 there is shown a base assembly 1 which is to secure a rail 9 to a concrete support surface (not shown) therebeneath. The base assembly 1 comprises a rectangular base plate 2 with flat or planar upper and lower surfaces, on which is detachably mounted two opposed clip receiving members 3 (only one shown) locatable on either side of the rail 9. Each member 3 has two raised retaining shoulder portions 4 defining therebeneath spaces 5 into which one end of a conventional resilient rail clip 6, such as a Pandrol (RTM) type "e" series clip, can be inserted, usually by means of a known special tool (e.g. a Panpuller) to be retained therein. The base plate 2 will normally be fixed to a lower concrete supporting structure (not shown) by means of bolts 7 passing through apertures 8 in the member 3 and the base plate 2 and being screwed into the supporting structure below. A rail 9 is supported on the base plate 2 between the two clip receiving members 3 and the rail clips 6 are located to press down on the shoulders 10 of the rail in order to hold the rail 9 in position. A plurality of plates 2 with members 3 and clips 6 will be provided along the length of each rail 9.

As shown in Figs. 3 to 5, each free end of the shoulder portions 4 of the clip receiving member 3 is detachably mounted on the base plate 2 by means of

dovetail shaped end projections 12 slidable in a pair of elongate dovetail grooves 11 formed in the upper surface of the base plate, extending from one side of the base plate in a direction transverse to the normal axis of the rail, and in which slide the correspondingly shaped projections 12 on the ends of the shoulder portions 4 of the clip receiving member 3. The other side of each receiving member 3 is secured by means of a pair of retaining bolts 13 which pass through apertures 14 in the clip receiving member 3 and are received in threaded bores 15 in the base plate 2.

When it is desired to carry out remedial work in the region of an existing base assembly, due, for example, to deterioration of the concrete support structure in the region of the existing base assembly, at least one of the clip receiving members 3 and bolts 13 are detached from the base plate 2 of the new base assembly to allow the base plate 2 to be slid under an existing rail 9, passing through the gap between the lower surface of the rail and the concrete supporting structure therebeneath until the base plate 2 is in the desired position adjacent the existing defective base assembly which may be an identical base assembly 1 or alternatively may be a base assembly of other construction. In the latter case the base plate 2 will have a thickness less than or equal to the thickness of said other construction. Once the base plate 2 is in position, the clip receiving member 3 is slid onto the base plate with the projections 12 on the ends of the shoulder portions 4 of the clip receiving member 3 sliding along the dovetail grooves 11 in the upper surface of the base plate 2, and the retaining bolts 13 are then inserted. The bolt holes 14 in the clip receiving member 3 are slotted or elongate or oval to allow lateral adjustment of the position of the clip receiving member 3 on the base plate 2 to be made. Once in the correct position, the retaining bolts 13 are tightened to fix the clip receiving member 3 in place. Conventional rail clips 6, such as Pandrol clips, are then inserted to fix the rail 9 to the new base plate 2 and the main base plate retaining bolts 7 are inserted to secure the rail 9 in place. Finally, any resultant gap between the base plate 2 and the support structure

may be filled by injection grouting with a resilient compound, in accordance with normal practice.

Due to the ability to make limited lateral adjustment of the position of the clip receiving members on the base plate, by virtue of the elongate dove tail grooves 11 and the slotted bolt holes 14, once the base assembly has been installed, future lateral adjustment of the rail is possible to compensate for tolerances in the gauge when future re-railing work is carried out. Such adjustment is not possible with the prior art base plate systems, since once they are grouted in position they become fixed for the life of the system.

While, in the preferred embodiment, the detachable clip receiving member is retained on the base plate by means of a dovetail slot in the upper surface of the base plate and a cooperating correspondingly shaped projection on the clip receiving member, it is envisaged that other means for adjustably locating the clip receiving member in position may be used and it is envisaged that other means for removably attaching the clip receiving member to the base plate might be used. For example, the clip receiving member might be simply bolted to the base plate or separate clamp means might be used.

Because the base assembly according to the invention utilises commonly available conventional rail clips, once such base assemblies have been installed, future rail maintenance can be carried out in accordance with normal practice, in the same way as with the prior art base plate systems.

CLAIMS

1. A base assembly for mounting a rail on a support structure by means of resilient rail clips, said base assembly comprising a base plate and at least two spaced rail clip receiving members, characterised in that at least one of the rail clip receiving members is detachably mounted on the base plate such that the base plate can be slid between the underside of an existing rail and the support structure when the at least one rail clip receiving member is detached therefrom.

2. A base assembly as claimed in claim 1, wherein the at least one detachable clip receiving member is detachably retained on the base plate by means of at least one elongate groove, provided respectively in the upper surface of the base plate or in a lower portion of the detachable clip receiving members, cooperating with at least one corresponding projection, provided on the other of a lower portion of the detachable clip receiving portion or the upper surface of the base plate.

3. A base assembly as claimed in claim 2, wherein the width of the elongate groove increases from the surface to the bottom of the groove in the manner of a dovetail joint, the projection being shaped correspondingly, to resist a force acting to separate the clip receiving member from the base plate.

4. A base assembly as claimed in claim 2 or claim 3, wherein the at least one detachable clip receiving member is secured to the base plate by means of a bolt passing through a corresponding aperture in the detachable clip receiving member and being received in a threaded bore of the base plate.

5. A base assembly as claimed in claim 4, wherein the elongate slot extends from one side of the base plate in a direction transverse to normal axis of the rail and the bolt aperture is slotted to permit lateral adjustment of the

position of the clip retaining portion to be made with respect to the base plate.

6. A base assembly as claimed in any of claims 1 to 5, wherein the height of the base plate at least in the region thereof to be located under the rail and to the end or side in the region of the at least one detachably mounted clip receiving member is located is less than the gap between the underside of the rail and the support structure.

7. A base assembly as claimed in any of claims 1 to 6, wherein the upper surface of the base plate is substantially flat or planar.

8. A base assembly for mounting a rail on a support structure by means of resilient rail clips, said base assembly comprising a base plate, at least two spaced rail clip retaining members being detachably mounted on the base plate and wherein the base plate has at least a substantially flat or planar upper surface in which mounting apertures for the clip retaining members and for a plate securing bolt are provided.

9. A base plate assembly as claimed in claims 1 to 8 whenever installed in under a laid rail of a rail track.

10. A base plate assembly as claimed in claim 9 wherein the overall height of the base plate or of the base plate and the at least one detachably mounted clip receiving member and securing means therefore is less than the space between the underside of the laid rail of the rail track and its support surface.

11. A method of repairing a rail system using a base assembly according to any preceding claims, the method comprising the steps of, without lifting the rail, passing a major portion of the base plate through the gap between the lower surface of the existing rail and the support structure with the at

least one detachable rail clip member unconnected to the base plate, positioning the base plate adjacent a defective base assembly, attaching and securing the detachable rail clip receiving member onto the base plate, fitting rail clips to the rail clip receiving members of the base assembly to secure the rail to the new base assembly and securing the base assembly to the support structure.

12. A method of repairing a rail system as claimed in claim 11, further including the step of filling any resultant gap between the underside of the base plate and the support structure by injection grouting with a resilient compound.

13. A base assembly substantially as hereinbefore described with reference to the accompanying drawings.

14. A method of repairing a rail system substantially as hereinbefore described with reference to the accompanying drawings.

Application No: GB 0030349.5
Claims searched: 1-14
Examiner: Roger Binding
Date of search: 29 March 2001

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int Cl (Ed.7): E01B 9/30, 9/34, 9/36, 9/48, 9/66, 29/32

Other: Online WPI EPODOC JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 1481645 A	(PANDROL)	1, 2, 6-10
X	GB 0350277 A	(VOSSLOH)	1-3, 9
X	GB 0331898 A	(SCHULTE), note especially the reference to a plate on page 1, line 73.	1, 6-10
X	EP 0794289 A1	(KRUPP), see the embodiment of Figs 1 & 2.	1, 6-10
X	WO 96/23107 A1	(IGWEMEZIE), see Figs 1, 3, 4, 8-10, 27 & 28.	1, 6-10
X	US 5221044 A	(GUINS)	1-3, 6-10
X	US 4988040 A	(KEUSCH)	1-3, 6, 9
X	US 4326670 A	(SHERRICK)	1, 2, 6-10

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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